02
CHAPTER

Alternatives Considered

This chapter summarizes the alternatives considered for the Honolulu High-Capacity Transit Corridor Project. Sections 2.2 and 2.3 of this Chapter discuss each alternative that has been considered in detail and the reasons that other alternatives were eliminated from detailed study, including alternatives not within the jurisdiction of FTA and the City. The No Build Alternative is included in the consideration. As described in Section 2.4, the Preferred Alternative identified in Section 2.5 and evaluated throughout this Final Environmental Impact Statement (EIS) resulted from a rigorous process involving compliance with and response to the Hawai'i Revised Statutes (HRS) Chapter 343 EIS preparation notice comment period, Alternatives Analysis, National Environmental Policy Act (NEPA) scoping process, and comments received during the public review of the Draft EIS.

The Project was developed following the process outlined in the U.S. Federal Transit Administration's (FTA) *Advancing Major Transit Investment through Planning and Project Development* (FTA, 2003), which is summarized as follows:

"Planning and project development for New Starts projects is a continuum of analytical activities carried out as part of the metropolitan planning and National Environmental Policy Act of 1969 (NEPA) review processes. Systems planning results in the identification and prioritization of transportation corridors in greatest need of more detailed planning and analysis. Alternatives analysis focuses on a specific transportation need (or set of needs), identifies alternative actions to address these needs, and generates information needed to select an option for further engineering and implementation. Once a Locally Preferred Alternative is selected and adopted in the region's long-range plan, the project sponsor may request FTA entrance into Preliminary Engineering (PE). PE includes additional engineering analysis and results in the completion of all environmental requirements. PE also typically marks the beginning of FTA's project management oversight function. The next stage of development is Final Design, which also requires FTA approval. It is within Final Design that candidate projects are considered by FTA for a Full Funding Grant Agreement."

Figure 2-1 illustrates the process annotated with major steps that have been completed for the Project. Following FTA guidance, the Alternatives Analysis defined the range of alternatives for evaluation in the NEPA process, and the NEPA scoping process was completed after identification of the Locally Preferred Alternative (FTA 2006b). As summarized in Section 2.2, the Alternatives Analysis process and the Draft EIS rigorously explored and objectively evaluated all reasonable alternatives. Under FTA's New Starts Program, the alternatives considered in the NEPA process may be narrowed in those instances when the Alternatives Analysis required by 49 U.S.C. 5309(e) is conducted as a planning study prior to the NEPA review (FTA 2005). In this scenario, FTA's PE approval was for the alternative that was advanced from the Alternatives Analysis into the NEPA process and selected as the Preferred Alternative within the NEPA process (FTA 2003). This Final EIS addresses the Build Alternative approved by FTA for PE. Following a 30-day publication notice on this Final EIS, FTA will issue a Record of Decision that will identify the selected alternative and conclude the Federal environmental review process.

2.1 Changes to this Chapter since the Draft Environmental Impact Statement

This chapter has been changed to reflect identification of the Airport Alternative as the Preferred Alternative for the Honolulu High-Capacity Transit Corridor Project. The term "the Project" refers to the Fixed Guideway Transit Alternative via the Airport that was evaluated in the Draft EIS. The following sections have been added since the publication of the Draft EIS or contain substantial new information in response to public and agency comments received on the Draft EIS. The introductory section contains additional information on the alternative and project development process. In response to comments, information about the elimination of at-grade light rail has been added to Section 2.2. Figures 2-17 through 2-39 in this chapter and the plans included in Appendices B and C reflect Preliminary Engineering design, including revisions that have resulted from coordination with agencies and landowners adjacent to the Project.

Section 2.3, Alternatives Considered in the Draft Environmental Impact Statement, describes alternatives considered, and Section 2.4, Preferred Alternative Identification Process, describes the selection process for the Preferred Alternative. Section 2.5, The Project: Fixed Guideway Alternative from East Kapolei to Ala Moana Center via the Airport, details the features of the Project. Section 2.5.4 provides additional information about safety and security, and Section 2.5.5 provides information about pedestrian and bicycle access to stations. Much of the detail of future bus operations has been moved from Section 2.5.6 to Chapter 3, Transportation. Section 2.5.8 identifies the site near Leeward Community College as the preferred site option for the maintenance and storage facility. Section 2.5.10 has been revised to reflect the latest project schedule and addition of the Salt Lake alignment as a planned extension that may be constructed as a future project.

2.2 Alternatives Screening and Selection Process

Prior to completion of the Draft EIS, a full range of reasonable alternatives were evaluated at three stages. First, a broad range of alternatives was considered and screened down to four alternatives for evaluation in the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (Alternatives Analysis) (DTS 2006b). Second, the Alternatives Analysis recommended, and the City Council selected, the Fixed Guideway Alternative as the Locally Preferred Alternative. Third, scoping for the NEPA process confirmed that there were no alternatives that had not been previously studied and eliminated for good cause that would satisfy the Purpose and Need at less cost, with greater

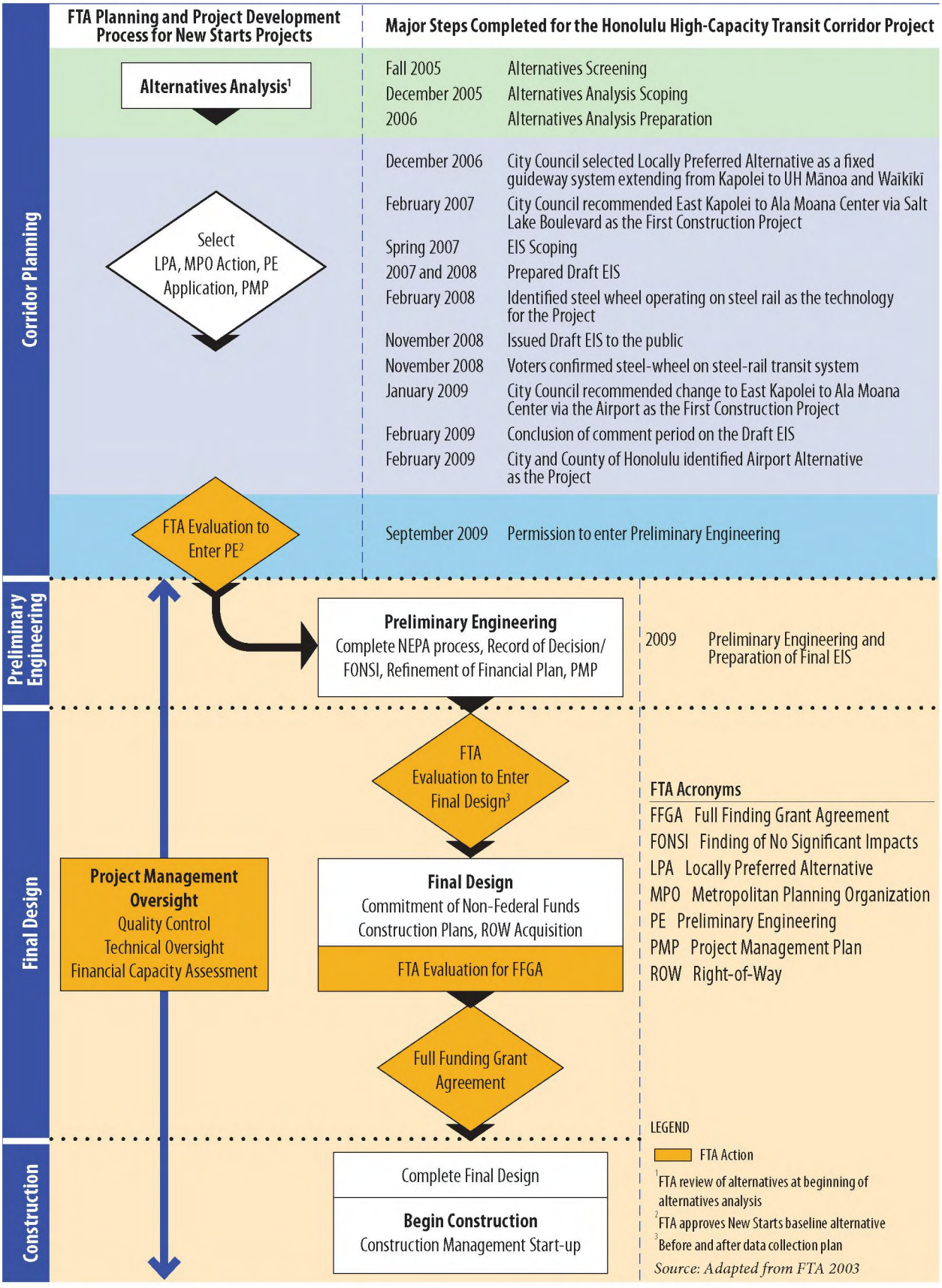

Figure 2-1 Planning and Project Development Process

effectiveness, or less environmental or community impact.

Prior to selecting an elevated fixed guideway system, a variety of high-capacity transit options were evaluated during the Primary Corridor Transportation Project (1998-2002) and Alternatives Analysis. Options evaluated and rejected include an exclusively at-grade fixed-guideway system using light-rail or BRT vehicles, as well as a mix of options consisting of both at-grade and grade-separated segments. In addition to comments received during the Alternatives Analysis and EIS scoping sessions, these studies provided a critical foundation for the conclusion that an elevated system would result in the best overall performance and better support the Purpose and Need for the Project.

2.2.1 Screening of a Broad Range of Alternatives

The Alternatives Analysis phase evaluated a range of transit mode and general alignment alternatives in terms of their costs, benefits, and impacts. An initial screening process considered alternatives identified through previous transit studies, a field review of the study corridor, an analysis of current population and employment data for the study corridor, a literature review of technology modes, work completed for the *O'ahu Regional Transportation Plan 2030* (ORTP) prepared by the O'ahu Metropolitan Planning Organization (O'ahuMPO) (O'ahuMPO 2007), and public and agency comments received during the formal Alternatives Analysis scoping process.

During the fall of 2005 and winter of 2006, the City and County of Honolulu (City) completed the alternatives screening process that is documented in the *Honolulu High-Capacity Transit Corridor Project Alternatives Screening Memorandum* (DTS 2006a). The alternatives screening was accomplished through an analysis completed in five major steps, as illustrated in Figure 2-2.

The first step was to gather input needed for the analysis. The input included the preliminary Purpose and Need for the Project, past studies and their recommendations, requirements of the FTA Section 5309 New Starts Program, adopted community and area plans, and a visual assessment of the entire study corridor. The second step used the information gathered to identify a comprehensive list of potential alternatives. The third step included developing screening criteria and undertaking the initial screening of all potential alternatives to identify those that would address the needs of the corridor and would not have any "fatal flaws." The fourth step included a scoping process that involved a presentation of the viable alternatives to the public and interested public agencies and officials to receive comments on the Purpose and Need, alternatives, and scope of the analysis for the Alternatives Analysis. Also, the HRS Chapter 343 EIS preparation notice for the Project was issued in December 2005, and review comments were received in December 2005 and

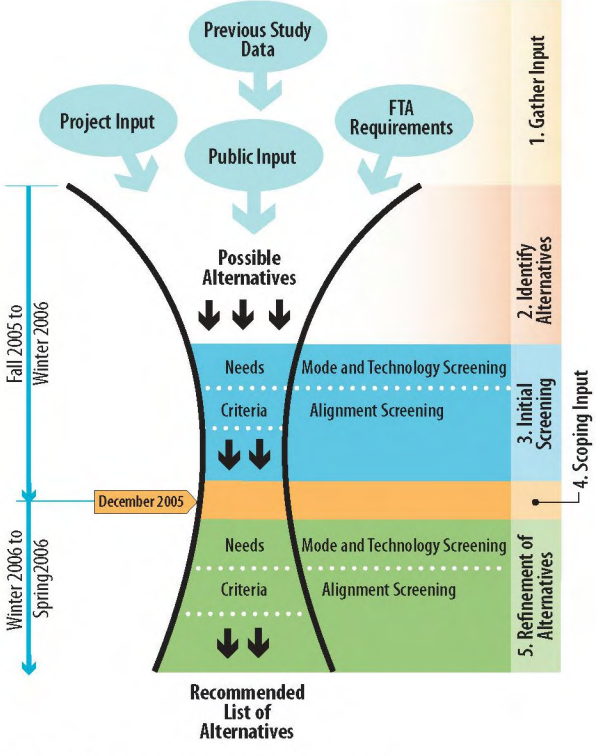

Figure 2-2 Alternatives Screening Process

January 2006. Finally, input from the alternatives analysis scoping process and HRS 343 EIS preparation notice comment period was collected and considered, and, where appropriate, refinements were made to the alternatives.

The following alternatives (Table 2-1) were eliminated through this screening process before the Alternatives Analysis.

- The tunnel crossing beneath Pearl Harbor was rejected because it would not improve connectivity within the study corridor, as it would bypass much of the corridor and it would not provide an alternative to the private automobile. The tunnel crossing also had been considered for the ORTP (O'ahuMPO 2007) but was rejected based on the cost compared to the limited benefit that it would have provided, as well as security concerns.
- Waterborne ferry service was eliminated as a primary transit system because its capacity and travel times were not competitive with the other alternatives considered. On a demonstration basis, ferry service was implemented in 2007 as part of a separate project to provide an additional transit option for travelers in the corridor. The service terminated in July 2009.

Several transit technologies also were eliminated from further consideration for various reasons (Table 2-1). Commuter rail, including diesel multiple unit, was eliminated based on poor operating and environmental performance because of the need for short station spacing in the study corridor. Personal rapid transit, which operates like a horizontal elevator, was eliminated based on lack of technical maturity and low capacity. Emerging rail concepts were eliminated because

Table 2-1 Alternatives and Technologies Considered but Rejected

	Why Rejected	When Rejected
Alternative		
Pearl Harbor Tunnel	Would not meet Purpose and Need; Rejected by O`ahuMPO based on high cost and limited benefit	Screening
Waterborne Ferry Service	Would not meet Purpose and Need; Insufficient capacity and uncompetitive travel time	Screening
Transportation System Management	Would not meet Purpose and Need; Would not have supported Honolulu General Plan; minimal reduction in vehicle miles traveled and vehicle hours of delay	Alternatives Analysis
Managed Lane Alternative	Would not meet Purpose and Need; Would not have supported Honolulu General Plan; increase in vehicle miles traveled and minimal reduction in vehicle hours of delay	Alternatives Analysis
Technologies		
Commuter Rail	Not suitable for urban transit	Screening
Diesel Multiple Unit	Not suitable for urban transit	Screening
Personal Rapid Transit	Unproven technology and insufficient capacity	Screening
Emerging Concepts	Unproven technology	Screening
Rubber-tired Guided Vehicles	Proprietary technology	After Alternatives Analysis
Magnetic Levitation	Proprietary technology unproven in U.S.	After Alternatives Analysis
Monorail	Proprietary technology	After Alternatives Analysis

they have never been proven in real-world use and would not meet the rapid implementation schedule for the project.

Corridor-wide at-grade light-rail transit was rejected because it would have required conversion of traffic lanes to rail throughout the corridor, thereby substantially reducing roadway capacity since no abandoned or undeveloped alignments are available in the study corridor. At-grade light-rail would have required either the acquisition and removal of buildings throughout the corridor or the conversion of two or more traffic lanes. Acquisition of right-of-way and the associated displacements would be required for stations in any event.

An at-grade system would not have provided a reliable, high-capacity, exclusive right-of-way system. Short blocks in the downtown area would limit the length of trains to two vehicles, and coordination of signals would limit headways to three minutes. This would prevent any future expansion of capacity. Average speed would be approximately one-half of that of an exclusive right-of-way system. Any automobiles that block the tracks, either at intersections or by trespass onto the tracks, as well as accidents that affect the tracks, would delay the transit system. This would not occur with an exclusive right-of-way system.

In addition, electrically powered trains are quieter than buses and because they come every few minutes rather than constantly, as does traffic, pedestrians and motorists are often unaware of their approach. The potential for accidents with at-grade light rail is substantially greater than it is with a separated right-of-way system. Excavation to a depth of between 4 and 5 feet would be required for the entire length of the at-grade system to construct track support. As a result, the potential for disturbance to archaeological resources or burials would be much greater than it would be for an elevated system.

For the Fixed Guideway Alternative screening analysis, the corridor was divided into geographic sections. Within each section, the alignments retained for evaluation in the Alternatives Analysis phase were those that demonstrated the best performance related to mobility and accessibility, smart growth and economic development, constructability and cost, community and environmental quality, and consistency with adopted plans. In total, 75 fixed guideway alignment options were screened (RTD 2006a).

2.2.2 Alternatives Considered in the Alternatives Analysis

Once the screening evaluations were completed, the modal, technology, and alignment options were combined to create the following alternatives, which were evaluated and documented in the *Alternatives Analysis Report* (DTS 2006b):

- No Build Alternative
- Transportation System Management (TSM) Alternative
- Managed Lane Alternative
  - Two-direction Option
  - Reversible Option
- Fixed Guideway Alternative
  - Kalaeloa-Salt Lake-North King-Hotel Option
  - Kamokila-Airport-Dillingham Option
  - Kalaeloa-Airport-Dillingham-Halekauwila Option

These alternatives were evaluated based on their effectiveness in meeting the Project's goals and objectives related to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and environmental quality, and planning consistency. All four alternatives were evaluated to the same set of criteria. This Final EIS summarizes the individual criteria for each alternative that differentiated it from the other alternatives. There were no other major issues identified for any of the alternatives.

The comparison of these alternatives concluded that the TSM Alternative would provide little benefit at a relatively low cost, and that the Managed Lane Alternative would provide slightly more benefit at a substantial cost. In addition to the technical findings, the overwhelming majority (more than 80 percent) of the nearly 3,000 public testimonies received during hearings on the selection of the Locally Preferred Alternative were in favor of some form of the Fixed Guideway Alternative. The findings for the TSM and Managed Lane Alternatives are summarized in the following sections. Table 2-2 compares the alternatives evaluated during the alternatives analysis process for several performance measures. While the results for the No Build and Fixed Guideway Alternatives that are summarized here differ from the values presented in the Draft EIS as a result of refinement to the analysis and additional engineering work, the relative performance of the alternatives has not changed.

For the Fixed Guideway Alternative as compared to the Managed Lane Alternative, the cost per hour of transit-user benefits would be between 160 and 240 percent less; daily transit trips would be between 14 and 20 percent greater; vehicle miles traveled (VMT) would be reduced by between 3 and 5 percent; and congestion, as measured by vehicle hours of delay (VHD), would be reduced by between 6 and 22 percent depending on the option constructed.

Transportation System Management Alternative

In the Alternatives Analysis phase, the TSM Alternative was developed to evaluate how well a combination of relatively low-cost transit improvements could meet the study area's transportation needs. FTA requires that the TSM Alternative reflect the best that can be done for mobility without constructing a new transit fixed guideway. Bus service was optimized, per FTA guidelines, by increasing bus service but without building a new fixed guideway for transit, such as a system of dedicated bus lanes. The analysis demonstrated that the Purpose and Need for the Project could not be met through a lower-cost, bus-based alternative alone.

After consideration of various service options and operating plans, the TSM Alternative was designed to serve the study corridor based on a

Table 2-2 Summary of Alternatives Analysis Findings

Alternative	Daily Islandwide Transit Trips	Vehicle Miles Traveled	Vehicle Hours of Delay	Hours of Transit-user Benefits[1]	Total Capital Cost (Millions 2006 Dollars)	Cost per Hour of Transit-user Benefit Compared to No Build
2030 No Build	232,100	13,971,000	82,000	N/A	$660	N/A
2030 Transportation System Management (TSM)	243,100	13,874,000	80,000	4,325,100	$856	$13.54
2030 Managed Lane	244,400–247,000[2]	14,002,000–14,034,000[2]	78,500–82,500[2]	5,528,500–5,632,700[2]	$3,601–$4,727[2]	$50.34–$63.42[2]
2030 Fixed Guideway	281,900–294,100[2]	13,464,000–13,539,000[2]	65,000–73,500[2]	15,153,600–18,770,200[2]	$4,192–$6,075[2]	$21.32–$27.05[2]

[1] Transit-user Benefits captures a set of benefits to transit riders—including reductions in walk times, wait times, number of transfers, and costs (converted to time)—in terms of savings in travel time.

[2] Range of values provided represents the range between options reported in the Alternatives Analysis Report (DTS 2006b).

hub-and-spoke network of bus routes, similar to today. The alternative included express bus service that operated as bus rapid transit in existing facilities. Bus frequencies would have been increased during peak periods to provide improved service for work-related trips, particularly from developing areas such as Royal Kunia, Koa Ridge, and Waiawa. The bus fleet was assumed to increase from 525 to 765 buses, and park-and-ride lots were assumed at West Kapolei, UH West O'ahu, Waipi'o, and Aloha Stadium. In addition, the present a.m. peak-hour-only zipper lane would have been modified to operate in both the a.m. and p.m. peak periods, and relatively low-cost improvements would have been made on selected roadways to give priority to buses.

The analyses found that the TSM Alternative would have improved transit travel times somewhat by reducing the amount of time riders would have to wait for a bus to arrive at a bus stop. As a result, the TSM Alternative would have led to a slightly larger number of daily transit trips than the No Build Alternative (Table 2-2). This alternative would have generated fewer hours of transit-user benefits than either the Managed Lane or Fixed Guideway Alternative. Since most buses would still operate in mixed traffic, the TSM Alternative would have done little to improve corridor mobility and travel reliability. Roadway congestion also would not have been alleviated. In addition, because of the dispersed nature of transit service, slow bus speeds, and unreliable service, the TSM Alternative would not have supported the City's goals of concentrating growth within the corridor and reducing development pressures in rural areas.

In terms of its environmental impacts, the TSM Alternative would have generated fewer physical impacts than the Managed Lane and Fixed Guideway Alternatives. However, it would have required more transportation system energy and generated more air pollutant emissions and water pollution than the Fixed Guideway Alternative.

Although the TSM Alternative would have been very cost-effective, financial feasibility was a concern. Currently, State legislation does not allow the local excise and use tax surcharge to be used for enhancement of the existing bus transit system.

Managed Lane Alternative

The Managed Lane Alternative would have provided a two-lane elevated toll facility between Waipahu and Downtown, with variable pricing strategies for single-occupant vehicles to maintain free-flow speeds for transit and high-occupancy vehicles (HOVs). Two design and operational variations of the Managed Lane Alternative were evaluated: a Two-direction Option (one lane in each direction) and a two-lane Reversible Option (Figure 2-3). For both options, access to the facility from 'Ewa and Central O'ahu would be via ramps from the H-1 and H-2 Freeways prior to the Waiawa Interchange. Both options would have required modification to the design of the Hawai'i Department of Transportation's planned Nimitz Flyover Project and would have terminated with ramps tying into Nimitz Highway at Pacific Street. An intermediate bus access point would have been provided near Aloha Stadium. The Two-direction Option would have served express buses operating in both directions during the entire day. The Reversible Option would have served peak-direction bus service, while reverse-direction service would have used the H-1 Freeway. Twenty-nine bus routes operating as bus rapid transit, with approximately 93 buses per hour, would have used the managed lane facility during peak hours for either option. The Alternatives Analysis found that of the two options, the Reversible Option would have provided a better transit-user benefit-to-cost ratio.

The Managed Lane Alternative was evaluated for its ability to meet project goals and objectives related to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and

environmental quality, and planning consistency. VMT would have increased compared to any of the other alternatives. While this alternative would have slightly reduced congestion on parallel highways, systemwide traffic congestion would have been similar to the No Build Alternative as a result of increased traffic on arterials trying to access the facility. Total islandwide VHD would have increased with the Managed Lane Reversible Option as compared to the No Build Alternative, indicating an increase in systemwide congestion (Table 2-2). Transit reliability would not have been improved except for express bus service operating in the managed lanes. The Managed Lane Alternative would not have supported planned concentrated future population and employment growth because it would not provide concentrations of transit service that would serve as a nucleus for the development. The Managed Lane Alternative would have provided very little transit benefit at a high cost. The cost-per-hour of transit-user benefits for the Managed Lane Alternative would have been two to three times higher than that for the Fixed Guideway Alternative (Table 2-2). Similar to the TSM Alternative, the Managed Lane Alternative would not have substantially improved service or access to transit for transit-dependent communities.

The Managed Lane Alternative would fail to meet the Project's Purpose and Need, as described in Chapter 1 of this Final EIS, because it fails to moderate anticipated traffic congestion. It also would be less effective than the Fixed Guideway Alternative at providing a faster and more reliable public transportation service as well as an alternative to private automobile travel.

The Managed Lane Alternative would have generated the greatest amount of air pollution, required the greatest amount of energy for transportation use, and would have resulted in the largest number of transportation noise impacts of all the alternatives evaluated. Because the Managed Lane Alternative would have served a shorter portion of the study corridor, it would have resulted in fewer displacements and would have impacted fewer archaeological, cultural, and historic resources than the Fixed Guideway Alternative. The Managed Lane Alternative would not have affected any farmlands. Visually, the elevated structure would have extended a shorter distance, but it would have been more visually intrusive because its elevated structure, with a typical width of between 36 and 46 feet, would have been much wider than the Fixed Guideway Alternative. It would have provided little community benefit, as it would not have resulted in substantially improved transit access in the corridor. Lastly, no funding sources were identified for the Managed Lane Alternative.

Fixed Guideway Alternative

The Fixed Guideway Alternative presented in the Alternatives Analysis included the construction and operation of a fixed guideway system between Kapolei and the University of Hawai'i at Mānoa (UH Mānoa). The study corridor for the Fixed Guideway Alternative was evaluated in five geographical sections to simplify the analysis and facilitate evaluation (Figure 2-4).

Each alignment was evaluated individually and compared to the other alignments in the respective section in relation to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and environmental quality, and planning consistency.

Effects to aquatic resources would have been similar for each of the Fixed Guideway options evaluated in the Alternatives Analysis. Each option included construction of an elevated fixed-guideway through much of the corridor. The various alignments generally crossed the same water resources but at different river miles. The Kamokila–Airport–Dillingham–King Option would have tunneled under Nu'uanu Stream rather than being on a bridge above the stream. This

option was was not financially feasible, however, since its costs exceeded the other options by more than $500 million.

The comparison resulted in an optimal alignment of Saratoga Avenue/North-South Road to Farrington Highway/Kamehameha Highway to Aolele Street to Dillingham Boulevard to Nimitz Highway/Halekauwila Street/Kapi'olani Boulevard.

The Alternatives Analysis included an evaluation of light-rail transit with at-grade operation in portions of the corridor. The Kalaeloa–Salt Lake–North King–Hotel Option included at-grade operation on Hotel Street that would have reduced visual impacts Downtown; however, it also would have decreased system speed, capacity, reliability, safety, and roadway capacity and speed. The Kalaeloa–Salt Lake–North King–Hotel Option had the greatest potential for disturbance of archaeological and burial resources and would have caused the greatest number of residential displacements. It would not have substantially changed impacts to other environmental resources. It would not have provided overall project cost savings, including the connections to grade-separated operations.

Summary of Alternatives Considered during the Alternatives Analysis

The Fixed Guideway Alternative performed better at meeting the project's Purpose and Need than any of the other alternatives evaluated in the Alternatives Analysis. A fixed guideway system would improve transit performance and reliability, be more cost-effective, and would substantially reduce VHD for all travelers, not just transit users (Table 2-2).

Table 2-1 summarizes the alternatives considered but rejected. The Managed Lane Alternative would not have qualified for local excise and use tax surcharge funding. Because single-occupant vehicles would have been permitted, even if tolled, Federal New Starts funding could not have been used. Because the Managed Lane Alternative would not have met the Project's Purpose and Need, would not have resulted in substantially fewer environmental impacts, and would not have been financially feasible, it is not a practicable alternative.

The TSM Alternative would not have substantially reduced congestion relative to the No Build Alternative and would not have improved corridor mobility and travel reliability; therefore, it would not have met the Project's Purpose and Need and is not a practicable alternative.

After review of the *Alternatives Analysis Report* (DTS 2006b) and consideration of public comments, the City Council selected a fixed guideway transit system extending from Kapolei to UH Mānoa with a connection to Waikīkī as the Locally Preferred Alternative. The selection, which eliminated the TSM and Managed Lane Alternatives, became Ordinance 07-001 on January 6, 2007.

2.2.3 Alternatives Consideration Process after the Alternatives Analysis

Ordinance 07-001 authorized the City to proceed with the planning and engineering of a fixed guideway project from Kapolei to UH Mānoa with a connection to Waikīkī. The City Council also passed City Council Resolution 07-039, which directed the first construction project to be fiscally constrained by anticipated funding sources and to extend from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

The FTA issued a Notice of Intent to prepare this EIS in the *Federal Register* on March 15, 2007. All interested individuals and organizations, as well as Federal, State, and Local agencies, were invited to comment on the Purpose and Need to be